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ZANZIBAR PROTECTORATE

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ANNUAL REPORT

on the

DEPARTMENT OF AGRICULTURE

for the year ended 31st December, 1944

SECTION I.

AGRICULTURE IN THE PROTECTORATE.

GENERAL.

The main activities of the Department continued to be the production of food crops in the endeavour to make the country as nearly self-supporting as possible.

With regard to supplies of imported foodstuffs the year has been the most difficult one experienced to-date owing to the deterioration in the supply position in the countries of origin. This has been particularly the case in regard to supplies of rice, ground-nuts, sim-sim, ghee and pulses.

THE WEATHER.

The rainfall of the year was above the average for all areas in Zanzibar but it was slightly below the average for Pemba. The year commenced with hot dry weather conditions following upon the failure of the "vuli" rains at the end of 1943. The main rains which commenced towards the end of March continued into the early part of May. After the cessation of the main rains the weather was exceptionally favourable for agriculture, being characterised by fine sunny periods with regular light showers at intervals. The "vuli" rains of October to December were heavier than normal, especially during November and early December when there was persistent rain and cloudy weather over a protracted period during which there was very little sunshine.

THE PRINCIPAL CROPS.

Cloves.—The exports of the calendar year were approximately 6,500 tons, some 500 tons less than in the previous year. The overseas demand for cloves was quite good in all the circumstances, and the fall in exports is due, in the main, to limited allocations of freight space.

It is of interest to note that during the five year period—1939/1943—exports averaged about 10,000 tons, comparing favourably with pre-war averages.

Buying prices in respect of the seasonal year—1st July, 1944 to 30th June, 1945—were declared by the Clove Growers Association, the price for fair quality remaining unchanged at Shs. 42.00 per 100 lbs. delivered at the Association's depot in Zanzibar. The buying price of commercial quality clove stems remained unchanged at Shs. 10.00 per 100 lbs.

The season's crop was a light one and the harvest was unusually late, the quantity of cloves picked during the "mwaka" season being negligible. Harvesting of the new crop did not commence seriously until late October. Approximately 11,978 tons came on to the market during the calendar year and the final figure for the season's crop is expected to be about 6,500 tons. The weather during the main harvesting period was very wet and cloudy. Under such unfavourable conditions producers experienced great difficulty in drying their cloves with the result that the bulk of the supplies reaching the market were inferior to fair. The bad weather was also responsible for the short supplies of stems on offer. The over all quality was poor, some of the supplies being exceedingly inferior.

Producers experienced great difficulty in securing their requirements of labour; pickers were unwilling to enter into contracts preferring to operate on the free-lance system. There appeared to be objection on the part of the pickers to registration. The movement of Zanzibar pickers to Pemba was negligible.

On the Government plantations harvesting costs of green cloves commenced at 15 cents per pishi of 4 lbs. of green cloves rising later to 18 cents and, finally to 20 cents giving an average for the season of 16.4 cents.

Casualties from "sudden death" of the oldest age class of trees in certain plantation areas in Zanzibar continued to be severe. As was stated in last year's Annual Report it is becoming increasingly apparent that this generation of trees is in the process of dying out. Later in this report reference is made to the further steps which have been taken by Government for the purpose of increasing the number of free clove seedlings for the regeneration of affected plantations.

Coconuts.—The copra produced for export from the Protectorate, surplus to the requirements of East Africa, continued to be taken up under the purchasing arrangements with the Ministry of Food. The indications are that a general improvement in the quality of copra has been maintained. A feature of the year was the increased demand for copra from Kenya partly due to a short fall of supplies from Tanganyika.

The new price for copra under the disposal arrangements with the Ministry of Food was effective as from the 17th of May when the export price increase was 12½%. Although the increase was not as much as that recommended after consultation with the producers, the new price has gone a long way towards maintaining the economy of the industry. During the first quarter of the year stocks of copra had been held up pending the anticipated price adjustment. The price for coconut oil which was increased by 12½% proved unattractive to expellers with the result that very little oil was tendered for export during the first half of the year. Further negogtiations in July resulted in a higher price being secured amounting to 17% over the 1942 price.

Approximately 14,500 tons of copra and 400 tons of coconut oil were exported. The export of copra is the highest total on record and it is estimated that about 4,000 tons of copra were produced and used in processing oil and for the manufacture of soap in addition to an export of some 460,000 coconuts and an unknown con-

sumption of fresh coconuts. The quantity of coconut oil available for export was very much lower than that for the previous two years. Part of the short fall is due to the unattractive price offering for oil early in the year, partly to the shortage of spare parts for replacements in expelling plants and partly to the manufacture of soap for export totalling about 650 tons.

Expellers of oil were able to maintain the industrial standard of quality but found difficulty in reaching the required standard of quality for edible purposes.

As a consequence of the fixed export price and selling arrangements, the local market price remained steady throughout the year in marked contrast to the fluctuations which prevailed in former years. Prices for nuts kept steady and there was no difficulty experienced in disposing of all that were offered for sale.

The sale price of matured coconuts on the Government plantations averaged Shs. 41.23 cts. per thousand compared with Shs. 35.23 cts. per thousand in 1943. The average price obtained for copra produced on the Government plantations was Shs. 14.56 cts. per 100 lbs. or Shs. 5.10 cts. per frasila compared with Shs. 13.12 cts. and Shs. 4.59 cts. respectively in 1942. The range of prices for F.M. quality on the local market during the year was from Shs. 11.58 cts. to Shs. 15.00 cts. per 100 lbs; the feature being a steady movement from the lower level to the higher level during the course of the year.

FOOD CROP PRODUCTION.

A full account by Mr. F. B. Wilson, M.B.E., Agricultural Officer entitled "Emergency Food Production in Zanzibar" was published during the year in the October number of the East African Agricultural Journal describing the methods employed in the campaign to increase the Protectorate's degree of self-sufficiency by the production of its own food supplies.

Much thought and combined effort has been devoted by the staff of the Department in the closest collaboration with the Administration in building up and carrying into practical effect an organisation and plans aimed at making the rural population almost independent of external supplies of staple foods and to provide, in addition, a substantial surplus of some staples including fruit for consumption by the non-producing population of about 60,000 people in Zanzibar town.

At the beginning of the year the stage had been reached in this "combined operation" as a result of registration, detailed advance planting programmes supported by propaganda, compulsory planting orders, inspection of plots, etc. which left no doubt in the minds of all concerned as to what the objectives were and how they were to be achieved. The essence of the campaign has been the concentration on one crop at a time. It only remained for the weather to be favourable to get the maximum results from these efforts.

The year began, as did the previous year, under drought conditions owing to the failure of the "vuli" rains between October and December last year which resulted in the loss of a grain harvest and the failure to establish a seasonal planting of cassava. Despite this setback the supply position of starchy food was better than during the same period in 1943 due to the very extensive planting of cassava in the main season nine months earlier, thus providing further evidence of the value of cassava as a reliable crop through times of drought.

On their return from the light clove harvest, cultivators turned their attention to the preparation of their rice plots in compliance with an Order enforcing the preparation of half an acre of rice land. By the beginning of January very extensive areas had been cleared ready for planting but weather conditions were totally unfavourable for sowing and cultivators continued to enlarge their plots whilst waiting for rain. Favourable rain fell in the last week in January. The whole of February was dry and hot and in the middle of the month there was a serious visitation of army worms (Laphygma exigua) in the best rice areas. By the end of February the attack had passed off. Where the crop had been well established recovery from the damage was good as a result of showers of rain in early March but small seedlings, on the other hand, were unable to withstand defoliation and the dry conditons and a great number of rice plots had to be resown.

During the rice harvest a comprehensive survey of yields was undertaken in Zanzibar in the same manner as last year. The average yield of paddy was 1,180 lbs. per acre compared with 1,499 lbs. per acre for the previous year. The army worm attack combined with the drought in the critical stages of the crop's growth were responsible for the reduction in yield. The yields recorded from the rice fallowing trials in the districts and also from other trials conducted on the Experiment Station were also below average.

In March an Order was made to enforce the planting of sweet potatoes by every registered adult male in Zanzibar, and a similar Order was made in Pemba. An Order was also made to enforce the planting of cassava in Pemba but in Zanzibar no Order was required owing to extensive planting. In the case of sweet potatoes the value of the Order lies in the date, which provides for an early start to be made and this is contrary to usual practice. The benefits are two-fold for not only is the season extended and valuable extra food raised but also an abundance of planting material is provided by the early drive enabling cultivators to continue with plantings at regular intervals throughout the cool season. This year planting material at the beginning of the season was again scarce due to the failure of the previous "vuli" rains.

The campaign for planting half an acre of pulses on the rice stubbles after the harvest could not be fully undertaken owing to the impossibility of obtaining sufficient seed for the bulk of which it is necessary to depend upon the mainland Territories. The Department prepared demonstration plots, however, in all the main rice growing centres showing the benefits of this innovation which not only provides the owner with a very valuable food in short supply but also reduces very considerably the labour of preparation for the succeeding rice crops. Besides these benefits good fertile land is under a suitable crop instead of lying idle.

Considerable quantities of maize and millet seed were imported and made available to the cultivators in the East Coast Area who were abnormally short of seed due to the loss of their grain crops in the drought. Departmental supplies of planting material of cassava and sweet potato were required in very much less quantity than hitherto.

As regards the quantity of surplus food supplies including fruit which is available for the population in the town of Zanzibar from the districts, records have been kept with the co-operation of the Police Department of all produce passing into the town. The delivery of staples to the town averaged 714 tons a month for the period April to December during which records were taken.

There has been a spectacular increase in the quantity of vegetables grown for sale through the chief town market in Zanzibar. Approximately 40,300 baskets were sold this year compared with 24,300 in 1943. These figures do not represent all the vegetables reaching the town. The amateur vegetable growers, at Marhubi, of whom mention was made in last year's report, enjoyed a successful year and much useful experience and valuable knowledge has been gained which has enabled growers to extend the season during which many of the vegetables can be grown.

DOMESTIC EXPORTS.

The table below gives the extent of the exports of domestic produce for the year and shows that the coconut industry has made a very appreciable contribution to the income of the producer, the value of coconut products being 34.12 per cent of the domestic exports in constrast to 24.27 per cent for the preceding year and 8 per cent for 1942. The total domestic exports of the land amounted to some 24,200 tons or, approximately, 2 cwts. per head of the population.

TABLE.

Item.	Unit.	Quantity.	1944 Declared Value. £	Per cent of Total Value.
Cloves	cwt.	129,405	443,614	51.12
Clove and Stem Oil	,,	4,415	95,940	11.06
Copra	,,	291,000	249,308	28.73
Coconuts	nos.	459,120	1,869	0.22
Coconut Oil	cwt.	7,868	13,379	1.54
Oil Cakes	,,	16,242	5,062	0.58
Common Soap	,,	12,998	26,432	3.05
Fresh Fruit	,,	—	12,883	1.48
Vegetables	,,	242	384	0.04
Tobacco	,,	340	951	0.11
Chillies	,,	242	760	0.09
Mangrove Bark	,,	34,820	15,491	1.78
Total	cwt.	497,572		
Ox Hides	cwt.	327	1,074	0.12
Sheep and Goat Skins	nos.	15,794	674	0.08
Total		—	867,821	100.00

SECTION II

WORK OF THE DEPARTMENT OF AGRICULTURE.

GENERAL.

The Director, Mr. J. C. Muir, O.B.E., left Zanzibar in May on transfer to take up his appointment as Director of Agriculture, Trinidad. Susequently Mr. R. O. Williams, O.B.E., was appointed Director of Agriculture but had not arrived to take up his appointment at the end of the year. Mr. R. M. Davies, Senior Agricultural Officer, was appointed Acting Director of Agriculture from May 24th. Mr. J. M. Jamison, Assistant Manager of Plantations, proceeded on leave on the 4th of December prior to the termination of his agreement and handed over to Mr. I. G. C. Squire, Manager of Plantations. Mr. L. W. Raymond, Government Chemist, remained seconded to the Secretariat and Mr. J. E. Baker, Agricultural Officer, continued as Assistant Food Controller in Pemba. Messrs. G. E. Tidbury, Agricultural Officer and A. C. E. Callan, Inspector of Produce, proceeded on curtailed leave. The Director and subsequently the Acting Director continued to function as Food Controller. It is gratifying to record the award of the Brilliant Star to Mr. J. C. Muir, O.B.E. and of the M.B.E. to Mr. F. B. Wilson in recognition of their services to the Protectorate.

The important task in the plan for the systematic regeneration of old clove areas has been proceeded with. Further provision has been made for ten additional new nurseries thereby increasing the supply of selected free seedlings to approved plantation owners by one hundred thousand. The first batch of fifty thousand selected free seedlings from the five clove nurseries financed by the Clove Growers Association were distributed for planting to approved applicants, who received assistance and advice from the staff of the Department on the recommended method of interplanting. In addition, the sale of selected clove seedlings from existing Government nurseries has been maintained at a level of over one hundred thousand per annum. Weather conditions following upon the drought at the end of last year were most favourable for the establishment of seedlings in the field. The supervision of all clove nurseries and the programme of regeneration in the field in Zanzibar was placed in the charge of the Manager of Plantations.

School gardens in Zanzibar and Pemba continued to receive assistance and advice from members of the staff of the Department as well as issues of seed and planting material when required. Generally school gardens were well kept but it is evident that many of the plots are showing signs of exhaustion from continued cropping and from lack of adequate ameliorative measures for the soil. Regular fortnightly visits were paid to the Kizimbani Experiment Station by the senior boys from Dole School which adjoins the station. Such visits permit of the boys receiving valuable practical demonstrations covering the whole field of husbandry. Weekly lectures in animal husbandry were given at the school by an Assistant Veterinary Officer stationed at Kizimbani, in charge of the stock farm. Three more pupils who had passed through the Dole School were recruited for training at the Experiment Station with a view to qualifying for posts in the Department of Agriculture after three years training.

Some 900 tons of compost for sale was manufactured during the year at the Marhubi site instituted in 1942. Approximately 400 tons were supplied to vegetable growers. There was a greater demand for compost from other users than could be met, notably for gardens in town and for recreational spaces. Slaughter house material and some town refuse were transported to add to the composting material.

Despite active encouragement and an increase in price in July to Shs. 2.00 per lb. for first grade wild Landolphia rubber tappers only produced 300 lbs. An endeavour was made by the Department to extract rubber from a small abandoned and remote Ceara plantation in Pemba. Early samples proved unattractive but later in the year when proper tapping knives were received good thin sheet rubber was produced but the cost of production in the experimental stage was high, approximately Shs. 5/- per lb.

During the year a comprehensive and detailed programme with estimates of cost for the agricultural development of the Protectorate was submitted to Government. Included in the programme is a scheme for clove research work by a team of specialists.

Mention should be made of the creation, during the year, of a Standing East African Agricultural Research Committee, which held two meetings at Nairobi both being attended by the Acting Director.

EXPERIMENT STATIONS.

A noticeable feature regarding the activities of the Kizimbani Experiment Station has been the gradual transformation of large areas of the station to accommodate, feed and pasture the foundation herd of selected local Zebu cattle started in 1942 and now numbering 116 head. The quality of the grazing, although improving, is still poor and the fitting in of additional grazing grounds, so as not to interfere with existing experiments, has presented difficulties.

Progress has been made in the construction of sound ant-proof and lasting quarters for the labour force. The building this year of the final block of 8-roomed bachelor quarters of sundried bricks has completed the programme of five such quarters. The provision of new married quarters is to be undertaken in future years. Much needed repair work on the roads of the station has been carried out. Advantage has been taken of the necessity to grow supplementary feed for the stock as well as for raising seed for sale to cultivators to utilize areas invaded by the pernicious

Imperata grass in the expectation of finally eradicating this weed on the station. Cassava, sweet potatoes and cowpeas have proved to be excellent cleaning and smothering crops providing the weather is favourable for their good growth as has been the case this year.

Special attention has been paid to encourage all sections of the public to visit the station so as to see for themselves the results of various experiments and demonstrations in the field. Arab administrative officers, representatives of the local Press and many plantation owners visited the station on more than one occasion. Particular attention was given to the entertainment of parties of District Headmen who are invited to bring leading cultivators from their areas. As a rule these excursions have been run in conjunction with some particular phase of the food growing campaign.

The two small seed stations, one at Mkwajuni in Zanzibar and the other at Limbani in Pemba, have provided useful quantities of planting material and seed selections to the districts. A few cattle and pens of poultry are maintained at both stations.

Cloves.—The greater part of the year's work has been the continuation of establishment trials, both cultural and manurial, further investigations of the manuring of the clove tree in all stages of its development, both with organic and inorganic fertilisers, and a continuation and expansion of practical clove regeneration in areas affected by "Sudden Death".

In the trials with organic and various mixtures of inorganic fertilisers on young clove plants raised under nursery conditions, there is further evidence that manuring produces no significant effects up to the age of four years on the deep red soils of Kizimbani. Experience seems to show that during this period of its life the young plant needs, more than anything else, regular care and attention, such as light shade when necessary and the complete eradication of weed growth from around the plant.

The results this year of the treatment of young bearing cloves planted in 1935 with artificial fertilisers and described at length in last year's report are interesting. The trees bore a crop during the "vuli" season. Only nitrogen caused significant responses this year although potash was again high. The interaction between nitrogen and potash and the triple interaction still cause decreases, although not significantly so. The estimated responses per acre were as follows:—

The response of the trees receiving 2 lbs. of Sulphate of Ammonia was, approximately, 1 lb. of dry cloves per tree valued at 20 cents per tree or Shs. 14.00 per acre. The manure cost Shs. 19/- and from a crop angle only the application was unprofitable.

When the various manures are considered separately and in combination, the following mean responses to the individual fertilisers and the effect of the interactions between them are found. The figures represent the aggregate of harvests from the first harvest of 1938-39.

(a) Nitrogen has caused a mean increase of 816 lbs. of green cloves per acre to-date.

(b) Potash has caused a mean increase of 446 lbs. of green cloves per acre to-date.

(c) Phosphate has caused no significant differences in yield so far.

(d) The interaction between nitrogen and phosphate has caused a decrease of some 187 lbs. of green cloves per acre to-date.

(e) The interaction between nitrogen and potash in the last crop showed a fairly large decrease in yield which exceeded the increase of the previous crop and the aggregate now shows a decrease of some 76 lbs. per acre of green cloves to-date.

(f) The interaction between phosphate and potash still causes little difference in yield so far.

(g) The triple interaction between the three fertilisers continues to cause losses in yield which in the aggregate now amount to 240 lbs. of green cloves per acre.

The effects of manuring on height was quite insignificant in all cases although there is a slight indication that potash increased and the nitrogen potash interaction decreased height.

As regards girth all responses were insignificant though potash approached significance causing an increase of 0.75 inches per plant when the level of significance ($P=0.05$) was 0.82 inches. The strong negative effects on girth of the interactions phosphate and nitrogen and the triple interactions observed in previous years appear to be considerably lessened this year and it will be of interest to observe whether the heavier manuring received as a result of this interaction will become beneficial in the future as the trees grow although it certainly is not yet reflected in the yields.

It would appear that failure to achieve significance is, in several cases, due to the wide variations in plot yield, for instance, the plots receiving a dressing of all three fertilisers yielded 89, 129, 346 and 221 lbs. of green cloves.

Further interesting results have been obtained from the two trials reported on last year. These two simple observational trials can only be regarded as indications. The results of the trial on the manuring of a few mature trees with copra meal and artificials were as follows:—

Treatment.	No. of Trees.	Average Yield lbs. Green cloves per tree. 1943	1944
Control	10	83.5	134.5
Coconut meal	8	160.6	170.0
Artificials	8	138.3	138.3

There is an indication that the application of coconut meal, a by-product of copra crushing, to mature clove trees produces increased yield of cloves. Statistcal experiments to verify this hypothesis have now been laid down at the station.

The other manurial trial on randomised rows of saplings treated with copra meal applied at three different levels was further elaborated by the addition of dressings of sulphate of ammonia applied at 1 lb. and 2 lbs. per tree. It was unfortunate that, despite careful precautions, some cloves were harvested by free-lance pickers who trespassed from the adjoining plantation. The following results are, therefore, given with some reserve:—

Treatment.	Average Yield lbs. Green cloves per tree.
Control—no manure	0.9
Sulphate of Ammonia 1 lb.	1.8
Sulphate of Ammonia 2 lbs.	0.6
Coconut meal 12 lbs.	1.8
Coconut meal 25 lbs.	0.8
Sulphate of Ammonia 1 lb. Coconut meal 12 lbs.	1.0
Sulphate of Ammonia 1 lb. Coconut meal 25 lbs.	1.8
Sulphate of Ammonia 2 lbs. Coconut meal 12 lbs.	2.1
Sulphate of Ammonia 2 lbs. Coconut meal 25 lbs.	1.4

No deduction can be made from these very small initial yields but it is hoped that as the saplings mature and produce larger crops significant results may be obtained.

A further supply of a few clove plants grafted on guava stocks were received from the East African Agricultural Research Institute, Amani at the end of 1943. These plants were put out in the field during the rainy season this year, and several show quite promising growth and others remarkable recovery from set-backs.

Solutions of the minor elements were applied to plots of clove seedlings but produced no noteworthy symptoms except in the case of boron which caused colour changes in the leaves. Leaf samples from all the treated plants were collected, dried and despatched together with others from "Sudden Death" and "Dieback" trees to Dr. Wallace, Director of the Long Ashton Research Station, for spectrographic analysis.

In October 1942 twelve mature clove trees were selected in a block which was rapidly being decimated by "Sudden Death" for experimental watering in order to see the effect of maintaining a constantly moist soil. The treatment consisted in giving all the trees a watering equivalent to a sixteenth of an inch of rainfall per day provided that not more than one-quarter of an inch of rainfall had occurred during the previous 24 hours. The rate at which the trees undergoing the watering treatment died was not dissimilar from the control area. It is reasonable to assume, therefore, that artificial watering of an over-mature stand of cloves does not materially affect the onset of sudden death.

In view of the surface rooting habit of the clove tree and the custom of owners to hoe through their plantations, observations have been begun to ascertain at what periods of the year the roots are in a state of active growth. It appears from preliminary examinations that there is a periodicity and that roots are in very active growth during a comparatively long period from March to August and again over a much shorter period during November.

The experiment on the regeneration of a block under a gradual reduction of canopy has provided an excellent demonstration of successful regeneration of a "Sudden Death" site under the system of management recommended for ordinary plantation conditions. The young saplings interplanted between the rows of old trees before they died are now coming on well and there have been few casualties. This block is of considerable interest and value.

The experiment on the regeneration of cloves under various nurse crops and shade trees is being continued.

A trial was laid down to ascertain the value of applying organic manure to the planting holes prior to planting out clove seedlings compared with applying the manure as a top dressing after establishment. The manures used were compost, farm yard manure and coconut meal. The manures applied in the pits caused more casualties than the top dressings and give no improvement in apparent condition after one year.

This experiment has made it quite clear that coconut meal is too dangerous a manure, because of its heating tendency, to be used indiscriminately in establishing clove seedlings. The same is true, to a lesser degree, of the other manures and it must be concluded that even a small quantity of any of these manures may do more harm than good if applied to the roots of the clove seedling on establishment. Other trials leave no doubt as to the value of top dressings at a rather later stage in growth.

Coconuts.—There is little fresh information to report under this head. The normal recording of individual palm yields in the experimental blocks and of the selected high yielding palms was continued. The casualties in the seed palm block were again very heavy, due to white ant attack accentuated by the very poor condition of the plants.

The modified manurial trial referred to in last year's report was begun and the whole area received a dressing of lime at the rate of 3 tons per acre. Manurial treatments consisted of dressings of coconut meal, artificial fertilisers and a combination of both. Although no significant results were recorded it is worth noting that the yield of the block this year has been 18 per cent above the average for the five years. It is possible that the liming has had a beneficial effect on the area as a whole.

The simple trial in which half a block of 600 recorded palms is cultivated to food crops and the other half has the weeds slashed gave a difference in yield in favour of the slashed area whereas the opposite was the case in 1943. The production of food crops on the area cultivated proved quite uneconomic under the fairly dense shade of the palms.

Pineapples.—In general the year was a bad one for pineapples due to the failure of the "vuli" rains which caused the fruit to be small and woody and of low average weight. For this reason the results of the experiments this year are of less value than usual, especially when average weight of fruit is the criterion used.

The manurial experiment was continued into the fifth year with the following results. The nitrogen dressing again caused significant increases in the total weight, total number and average weight of the fruit. These increases were 406 extra fruit per acre, 1,520 extra lbs. of fruit per acre and 0.433 lb. extra on the average weight of the fruit. These results are very similar to previous results from nitrogen. A significant increase from potash was obtained in average weight and total weight of fruit but not in the number of fruit. There was no significant interaction between nitrogen and potash this year. Phosphate still causes decreases in yield (insignificant) even after 5 years, indicating, apparently, that the soil still provides more than enough of the phosphate needed.

The first harvest from the factorial experiment has yielded interesting results. The experiment was laid down when the effects of nitrogen and of spacing were roughly understood though more details as to levels were needed, but when it was thought that phosphate and potash had similar effects in depressing yield. Subsequently it was found from the first manurial experiment that a significant response was obtained from potash in the fourth season whilst phosphate has still a depressing effect in the fifth season. This new trial links potash and phosphate together as a single treatment and though the strongly negative effect which emerges is typical of the first few years the later value of potash will not, unfortunately, be demonstrated. The results were as follows :—

(a) The effect of the potash plus phosphate dressing was the most strongly marked throughout. The combination decreases the total number and total weight of fruit significantly, but the effect on average size of fruit was quite insignificant. Thus the effect was brought about solely by reducing the number of plants which fruited in the first season.

(b) As was expected, close spacing caused the production of more fruit per acre. The effect on average weight was quite insignificant though this response is usually well shown. The dry season may account for this.

(c) The results from the nitrogen dressing were most disappointing in view of the spectacular increases given by nitrogen in the past. There is no doubt that yield was greatly increased by the higher dressing of nitrogen but this effect was masked by the stronger negative responses to potash plus phosphate.

(d) The strongly marked interaction between nitrogen and potash plus phosphate which caused the masking effects is shown in the analysis by significance in the case of "total number" and significance is approached in the case of "total weight". There was no marked interaction shown with "average weight".

It is clear from the results of experiments to-date on pineapples that although much valuable information has been obtained the practical field technique of commercial profitable pineapple culture for Zanzibar has yet to be evolved. There is little doubt that better methods of field husbandry are required, more particularly the question of efficient weed control, especially the eradication of pernicious weeds before the pineapples are planted. A field scale planting of pineapples has had to be abandoned because of the impossibility of eradicating Imperata grass after the crop had been planted.

Oil Palms.—The yield of the palms is increasing as is shown by the figures below:—

	1942	1943	1944
Average weight of bunches in lbs.	15.8	21.9	30.5
Average weight of fruit per bunch in lbs.	10.5	16.7	26.0
Average weight of oil per bunch	1.0	1.2	2.1

The average yield of pericarp oil per palm this year was approximately 6.4 lbs., which is a considerable increase on previous years. The Manager of Plantations, who has had wide experience of this crop, was able to introduce useful improvements in the process of oil extraction and on the cultivation side.

Citrus.—This season's crop of fruit throughout the Island was light compared with last year and the harvest from the station's orchard was no exception. There are some 340 bearing trees on the station raised on stocks of rough lemon and sour orange on to which had been budded selections from the best trees of the Zanzibar orange. From these bearing trees which are recorded for yield and quality of fruit budwood is used for the supplies of budded seedlings raised for sale to the public. Much improvement has been effected on the orchard by means of grazing stock in it.

The reason for the unsatisfactory growth of the nursery plants budded on sour orange stock referred to in last year's report was cleared up. At first it was thought that a deficiency of zinc might have been responsible and the plants were sprayed with zinc sulphate. At the same time the beds were given a dressing of mixed artificials as there was no compost available. The plants certainly responded to the manuring although there was no very obvious effect from the spray. Accordingly only rough lemon stocks were planted for the 1944 season and the beds were heavily composted and mulched. These grew well but were heavily attacked by Citrus scab which was controlled by regular spraying of Bordeaux Mixture. By the end of the season some two thousand budded oranges and one hundred grapefruit plants were available for sale to the public.

Miscellaneous.—The growing of bananas and plantains has been encouraged since the "Plant More Food" campaign was introduced. As a result there has been a regular demand for planting material of certain varieties and these demands are being catered for by the planting of two acres of the popular varieties for future distribution of suckers.

Blocks containing four introduced varieties of kapok are being maintained. The harvest from these trees was less than that for the four past years. Three of the blocks which were becoming invaded with weed growth were cultivated to food crops for the purpose of cleaning the land.

Further records were collected from a number of Forastero cocoa trees on the station with a view to providing seed from selected parents for a trial planting. The shade belt round the block in which the trial is to be planted has made good growth.

A consignment of derris root despatched to England amounting to 584 lbs. was very favourably reported upon for rotenone content containing the high average of 8.7%. Derris cultivation on the red soils is confronted with the difficulty of weed control and heavy harvesting costs of the root. Cultural trials involving the intercropping of derris with cassava to act as a weed controlling crop as well as a cash crop are being undertaken. The cultivation of derris on large ridges is also being experimented with.

Rice.—The local production of rice has become a most important factor in the war time food economy of the rural population in the Protectorate and considerable attention has, accordingly, been devoted towards all aspects of its cultivation, both on the station and in the districts. The investigational work on the station at Kizimbani on rice has consisted of the introduction and testing of new varieties combined with selection work, the multiplication of proved good yielding varieties for distribution, cultural experiments especially in regard to the period of fallow between successive rice crops and a survey of the rice growing areas in the districts.

Some eighteen varieties were carried forward from first year's trials for testing. The yield's of these, although reasonably good for the abnormal season experienced, were much below yields which have been recorded in previous seasons. This trial is being repeated next year as several of the varieties which had done well in previous trials did not perform well this year. The successful varieties, however, are being multiplied on a considerable scale for distribution in the districts. Of the thirteen new varieties under observation several appear very promising and are now being multiplied for inclusion in the 1946 trial.

The rice rotational trial is regarded as one of the most important for it aims at investigating the use to which paddy land may be put during the period of some six months between successive crops, the effect of various fallowing treatments upon subsequent yields and the maintenance of soil fertility. The experiment is in the form of randomised blocks on sites chosen in the various rice growing centres in Zanzibar and Pemba. The treatments consist in the cultivation of the stubbles either ridging or on the flat and the planting of pulses as leguminous fallow crops. The disposal of the straw and crop residues by burning, burying and composting are also included.

The yields on the Zanzibar plots were, unfortunately, very poor and no significant results were obtained. The trial in Pemba gave much better results which are worth quoting as giving an indication of the effects of the treatments.

Treatment.	Yield in lbs. of dry paddy. 1943	1944
Ridged Plots:		
Pulse crop (4 plots)	99.8	139.0
Weed growth (4 plots)	107.2	128.3
Total	207.0	267.3
	1943	1944
Flat Plots:		
Pulse crop (4 plots)	96.4	88.3
Weed growth (4 plots)	59.7	82.3
Total	156.1	170.6

The average increase of yield on the ridged plots over the flat plots calculated on an acre basis amounted to 375 lbs. and 605 lbs. for the two years respectively.

The beneficial effects of rotational cropping with ridge cultivation were regarded as sufficiently clear to warrant the general planting of pulses on the rice stubbles and the encouragement of ridge cultivation. Accordingly demonstration plots which attracted considerable interest from cultivators were laid down in all rice growing centres. The whole of the rice area on the station was treated in this way at a cost of

Shs. 117.00 and in the course of twelve weeks a crop of pulses worth Shs. 250.00 were reaped. Thus the crop itself more than paid for the cultivation whilst the land was cleaned, the wet valley soil well aerated and the whole of the crop residues were buried and contributed to the organic content of the soil. This pulse rotation evoked much enthusiasm from all visitors who came to see it at the station.

Cassava.—Steps have been taken to increase the area under cassava in order to meet the need for disease-free planting material for the public. A limited survey carried out in certain districts during the months of November and December into the incidence of cassava virus disease established the fact that some 55% of all plants examined were diseased. When classified it was ascertained that the percentage of diseased cassava was the same in the three age groups chosen. This indicated that the greater part of virus infection in the cassava fields of Zanzibar is from planting diseased cuttings i.e. primary infection which, as is well known, reduces yield far more completely than secondary infection. It is obvious that a great quantity of potential food is being lost because of disease infection and there is no doubt that the enormous increase in cassava planting had led to the indiscriminate planting of material carrying primary infection.

The results of the year's variety trial were as follows:—

Selection.	Yield in tons per acre.
K.64	5.7
K.11	5.1
K.91	4.9
K.50	4.7
K.65	4.5
K.85	4.4
K.127	4.2
K.52	4.0
Msitu	6.4

No variety of cassava has been found superior in yield to the "msitu". The trial is being continued.

A size of cuttings trial was conducted at Kizimbani Experiment Station for the purpose of finding out the effect of length and thickness of cuttings on the yield of cassava. Four lengths and three thicknesses of cuttings were used. Differences in yield due to thickness of cuttings were not statistically significant. Differences in yield due to length of cuttings were highly significant with the following results:—

12 inch cuttings are better than 9 inch and 6 inch cuttings.
15 inch cuttings are better than 6 inch cuttings.
9 inch cuttings are better than 6 inch cuttings.

Miscellaneous.—Yams, maize and sorghum are more suited to the drier areas of Zanzibar than to the wetter clove growing areas. Small quantities of selected varieties and seed were made available for cultivation. The station continued also to grow pulses, pumpkins, groundnuts, many varieties of garden and field beans, artichokes, local cucumbers as well as numerous kinds of vegetables which seed freely in order to maintain adequate supplies of seed for the public.

VETERINARY.

Live-stock Disease.—An outbreak of Rinderpest was discovered almost simultaneously in two areas, one in the vicinity of Zanzibar Town and the other at the tip of the Fumba Peninsula, 15 miles to the south of the town. Both outbreaks occurred amongst native cattle. Prompt control measures were taken and the disease did not spread. Kenya goat virus was used in the immunization of all bovines in Zanzibar Island including calves which received serum as well. Later, the immunization of all bovines except calves under one year old was undertaken throughout Pemba Island. Approximately 8,860 were treated in Zanzibar and 20,800 in Pemba. The mortality amongst the inoculated stock was negligible. The services of the Provincial Veterinary Officer, Dar-es-Salaam were made available by the Tanganyika Government for a short period after the outbreak occurred. The origin of the outbreak is a mystery. It is estimated that sixty-four animals died of rinderpest and forty-five animals were slaughtered including contacts and sick animals.

Cases of trypanosomiasis were found in various parts of Zanzibar District amongst cattle, particularly in the Magharib Mudiria. Treatment with penanthridinium is being tried with promising results, relapse cases being less frequent than with tartar emetic. Routine examinations of grade cattle in the dairy herds in the neighbourhood of the town showed a decrease in infection. Mass examinations of native-owned cattle in certain areas were continued.

Cases of anthrax occurred amongst goats and the outbreak was checked by strict control measures. Cases of haemonchiasis, East Coast Fever, mange, red water and tick fever in dogs were reported. Fowl typhoid and Newcastle disease appeared in the country districts but the mortality was not as great as in previous years.

General.—As a result of the very favourable weather during the second half of the year livestock fared very much better than it has done during the previous two years. Cassava root which is a popular supplementary food for dairy animals was in better supply and cheaper. Imported slaughter stock from Tanganyika amounted to 2,354 cattle, 11,189 goats and 765 sheep whilst 189 cattle, 2,245 goats and 168 sheep supplied from Somaliland were fewer than in recent years.

Stock Farm.—Good progress has been made with the foundation herd of local Zebu cattle at the Kizimbani Experiment Station especially in regard to the management of the herd, feeding, the improvement of the pasture, and the development of fodder crops. Many cattle owners have visited the station to see our methods and receive advice. There has been a steady improvement since July in the "milk index" figure which is now nearly seven and a half pounds per cow milk day. Under the supervision and training of the Assistant Veterinary Officer the staff and labour concerned with the management of the herd is rapidly being improved and gaining in experience. Three separate herds are maintained and these are no longer housed at night but are folded instead within small enclosures of hurdles in the grazing paddocks. This method of concentration of stock overnight in enclosures which are systematically moved after a few days is resulting in a noticeable improvement in the quality of the herbage without any detriment to the health or condition of the animals. Improved accommodation for all the calves has been provided for by adding a section to the cowshed. There has been no recurrnce of scour which was troublesome amongst the young calves in their old quarters. Improvements have also been made in the ventilation of the cowshed which had been designed to keep out biting flies.

More liberal rations are being fed to all the milking cows. The basic feed consists of 3 lbs. of cassava or sweet potato or pumpkin, 1 lb. rice bran and 2 lbs. simsim cake. Milkers giving more than 5 lbs. of milk per day receive twice this amount. The system of calf feeding described in the 1943 Annual Report is still in force and the results are entirely satisfactory.

Much of the area under arable crops on the station is losing fertility and the policy is a rotation of fodder crops, pasture and arable cultivation. The value of Pemba grass (Stenotaphrum dimidiatum) for grazing purposes is being investigated on different soil types. The fencing of some 120 acres of pasture into paddocks with wire pending the establishment of live fences has been completed during the year and the work continues.

The production of stock cockerels of the Rhode Island Red breed and of high quality eggs for setting for distribution and sale to the public have been an important function of the Kizimbani Experiment Station over the past twelve years. Unusually low fertility and poor incubation, for which there was no satisfactory explanation, reduced the output from the station considerable this year.

CHEMICAL LABORATORY.

The Government Chemist continued on secondment to the Secretariat but was able to supervise the work of the Laboratory and to deal personally with a few special examinations. He was on leave from 26th June to 15th October, during which time the Acting Director of Agriculture acted also as Government Chemist. The routine work of the Laboratory was carried on very ably by the Laboratory Assistants.

The number of samples received was 1,338. Of these 1,332 were from Government Departments (Agriculture, 1,249; Health and Medical, 42; Police, 31; Customs, 7; others, 3) and 6 from a private firm.

Clove oil exports accounted for 96 samples, representing approximately 205 tons of oil. The average eugenol content of clove stem oil was 92.4 per cent.

Samples in connection with coconut oil exports numbered 72, of which only 3 were rejected. All the samples were from bulks of industrial quality oil.

Regular examinations of the Zanzibar Public Water Supply gave uniform and very satisfactory results.

There were again numerous instances of gross watering of milk, the worst sample being 80 per cent deficient in solids-not-fat and 70 per cent deficient in fat. Of 35 samples examined, 22 were below standard and of these 16 were seriously so.

Four toxicological exhibits were examined.

The Laboratory made up and issued to the District Administration 7,000 sodium arsenite baits for poisoning wild pig.

SECTION III.

LEGISLATION.

No major legislation affecting agricultural industries was enacted during the year. An amendment to Rules under the Agricultural Produce Export Decree was made governing the payment of overtime fees. An Order controlling the importation of fowls into the Protectorate was made under the Diseases of Animals Decree and under the same Decree the application of Rule 13 was made to cover the District of Pemba in connection with the carrying out of the preventive inoculation of stock against Rinderpest.

A number of cultivation and planting Orders made under the Defence (Land Requisition and Personal Service) Regulations 1943 was issued during the year.

ACKNOWLEDGMENT.

I wish to record my appreciation of the loyal service and the wholehearted assistance given by the staff of the Department. The valuable assistance given by all members of the Provincial Administration and that received from other Departments also is gratefully acknowledged.

NOTE.—This report was drafted by Mr. R. M. Davies, Senior Agricultural Officer, who acted as Director of Agriculture from May 24th until the end of the year, before his departure on leave prior to taking up appointment as Land Settlement Officer, Tanganyika Territory, It was amended and finally completed after discussion with me.

I take this opportunity of acknowledging the high standard of Mr. Davies' work during his service in the Protectorate and the ready assistance he afforded me for the two months we were together.

R. O. WILLIAMS,
Director of Agriculture.

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